

WHAT IS CLAIMED IS:

- 1           1.       A method for managing data transmissions at a local network device  
2       communicating with a linked network device over a network, wherein each network  
3       device is capable of transmitting data at different speeds, comprising:  
4           initiating an operation to change a current transmission speed at which data is  
5       transmitted between the local and linked network devices in response to a speed change  
6       event;  
7           determining a new transmission speed different from the current transmission  
8       speed;  
9           setting a register in the local network device to indicate the new transmission  
10      speed; and  
11          transmitting a speed change request and the new transmission speed to the linked  
12      network device to cause the local and linked network devices to communicate at the new  
13      transmission speed, wherein the transmission occurs without terminating a linked  
14      exchange occurring between the local and linked network devices.
- 1           2.       The method of claim 1, wherein transmitting the speed change request  
2       comprises including the speed change request and the new transmission speed in a data  
3       packet being transmitted to the linked network device at the current transmission speed.
- 1           3.       The method of claim 1, wherein transmitting the speed change request  
2       comprises including the speed change request and the new transmission speed in a  
3       preamble packet that is transmitted at the beginning of data packets or in an idle  
4       transmission between packets to synchronize data transmissions at the current  
5       transmission speed.

1           4.     The method of claim 1, wherein the linked network device in response to  
2     the speed change request returns positive acknowledgment to the local network device if  
3     the linked network device is capable of transmitting at the new transmission speed.

1           5.     The method of claim 4, wherein the local and linked network devices  
2     continue to transmit data at the current transmission speed until the linked network device  
3     returns a positive acknowledgment.

1           6.     The method of claim 1, wherein the linked network device in response to  
2     the speed change request returns negative acknowledgment to the local network device if  
3     the linked network device is not capable of transmitting at the new transmission speed.

1           7.     The method of claim 1, wherein the operation to change the transmission  
2     speed comprises an operation to either increase the transmission speed if the local  
3     network device is capable of transmitting at a transmission speed that is higher than the  
4     current transmission speed or decrease the transmission speed if the local network device  
5     is capable of transmitting at a transmission speed that is lower than the current  
6     transmission speed.

1           8.     The method of claim 1, further comprising:  
2     maintaining transmission information indicating transmission capabilities of the  
3     linked network device, wherein the determined new transmission speed is a new  
4     transmission speed that the transmission information indicates that the linked network  
5     device is capable of performing.

1           9.     The method of claim 1, wherein a device driver used to communicate with  
2     the local network device determines the new transmission speed, wherein setting the  
3     registers in the local network device comprises the device driver changing advertised

4 capabilities of the local network device indicated in the registers, and wherein  
5 transmitting the speed change request comprises restarting an auto-negotiation process  
6 that selects a common transmission speed based on the changed advertised capabilities in  
7 the local network device.

1 10. The method of claim 9, wherein the determined new transmission speed is  
2 higher than the current transmission speed, and wherein changing the advertised  
3 capabilities comprises removing any transmission speeds indicated in the advertised  
4 capabilities of the local network device that are less than the determined new  
5 transmission speed.

1 11. The method of claim 9, wherein the determined new transmission speed is  
2 lower than the current transmission speed, and wherein changing the advertised  
3 capabilities comprises removing any transmission speeds indicated in the advertised  
4 capabilities of the local network device that are higher than the determined new  
5 transmission speed.

1 12. The method of claim 1, wherein the speed change event comprises an  
2 application program determining an anticipated increase of data transmissions through  
3 the local network device, and wherein the new transmission speed is higher than the  
4 current transmission speed.

1 13. The method of claim 1, wherein the speed change event comprises  
2 detecting a change in network traffic at the local network device.

1 14. A network device capable of functioning as a local network device or  
2 linked network device in a network, comprising:  
3 registers;

4 a network protocol including code to cause the network device, when operating as  
5 the local network device, to perform:

6 (i) initiating an operation to change a current transmission speed at which  
7 data is transmitted to the linked network device in response to a speed change  
8 event;

9 (ii) determining a new transmission speed different from the current  
10 transmission speed;

11 (iii) setting one register to indicate the new transmission speed; and

12 (iv) transmitting a speed change request and the new transmission speed to  
13 the linked network device to cause the linked network device to communicate at  
14 the new transmission speed, wherein the transmission occurs without terminating  
15 a linked exchange occurring between the local and linked network devices.

1 15. The network device of claim 14, wherein the code causes the network  
2 device, when operating as the linked network device, to perform:

3 in response to the speed change request, returning positive acknowledgment to the  
4 local network device if the linked network device is capable of transmitting at the new  
5 transmission speed.

1 16. The network device of claim 15, wherein the local and linked network  
2 devices continue to transmit data at the current transmission speed until the linked  
3 network device returns a positive acknowledgment

1 17. The network device of claim 14, wherein the code causes the network  
2 device, when operating as the linked network device, to further perform:

3 in response to the speed change request, returning negative acknowledgment to  
4 the local network device if the linked network device is not capable of transmitting at the  
5 new transmission speed.

1           18.    The network device of claim 14, wherein the code causes the network  
2    device, when operating as the local network device, to further perform:  
3            increase the transmission speed if the local network device is capable of  
4    transmitting at a transmission speed that is higher than the current transmission speed or  
5    decrease the transmission speed if the local network device is capable of transmitting at a  
6    transmission speed that is lower than the current transmission speed.

1           19.    The network device of claim 14, wherein the code causes the network  
2    device, when operating as the local network device, to further perform:  
3            maintaining transmission information indicating transmission capabilities of the  
4    linked network device, wherein the determined new transmission speed is a new  
5    transmission speed that the transmission information indicates that the linked network  
6    device is capable of performing.

1           20.    The network device of claim 14, wherein the speed change event  
2    comprises detecting a change in network traffic at the local network device.

1           21.    A computer system capable of communicating over a network with a  
2    device including a linked network device, comprising:  
3            a processing unit;  
4            a data storage device;  
5            a storage controller a storage controller managing Input/Output (I/O) access to the  
6    data storage;  
7            a network device capable of receiving data from the processing unit and  
8    communicating with the linked network device over the network, comprising:  
9            (i) registers;  
10           (ii) a network protocol including code to cause the network device to  
11    perform:

- 12 (a) initiating an operation to change a current transmission speed at  
13 which data is transmitted to the linked network device in response to a  
14 speed change event;
- 15 (b) determining a new transmission speed different from the  
16 current transmission speed;
- 17 (c) setting one register to indicate the new transmission speed; and
- 18 (d) transmitting a speed change request and the new transmission  
19 speed to the linked network device to cause the linked network device to  
20 communicate at the new transmission speed, wherein the transmission  
21 occurs without terminating a linked exchange occurring between the local  
22 and linked network devices.

1 22. The computer system of claim 21, further comprising:  
2 a device driver used to communicate with the local network device to determine  
3 the new transmission speed, wherein setting the registers in the local network device  
4 comprises the device driver changing advertised capabilities of the local network device  
5 indicated in the registers, and wherein transmitting the speed change request comprises  
6 restarting an auto-negotiation process that selects a common transmission speed based on  
7 the changed advertised capabilities in the local network device.

1 23. An article of manufacture for managing data transmissions at a local  
2 network device communicating with a linked network device over a network, wherein  
3 each network device is capable of transmitting data at different speeds, and wherein the  
4 article of manufacture includes code capable of causing operations in the network device  
5 functioning as a linked or local network device, the operations comprising:  
6 initiating an operation to change a current transmission speed at which data is  
7 transmitted between the local and linked network devices in response to a speed change  
8 event;

9           determining a new transmission speed different from the current transmission  
10 speed;  
11           setting a register in the local network device to indicate the new transmission  
12 speed; and  
13           transmitting a speed change request and the new transmission speed to the linked  
14 network device to cause the local and linked network devices to communicate at the new  
15 transmission speed, wherein the transmission occurs without terminating a linked  
16 exchange occurring between the local and linked network devices.

1           24.    The article of manufacture of claim 23, wherein the code causes the  
2 network device operating as the local network device to include the speed change request  
3 and the new transmission speed in a data packet being transmitted to the linked network  
4 device at the current transmission speed.

1           25.    The article of manufacture of claim 23, wherein the code causes the  
2 network device operating as the local network device to include the speed change request  
3 and the new transmission speed in a preamble packet that is transmitted at the beginning  
4 of data packets or in an idle transmission between packets to synchronize data  
5 transmissions at the current transmission speed.

1           26.    The article of manufacture of claim 23, wherein the code causes the  
2 network device operating as the linked network device to return, in response to the speed  
3 change request, positive acknowledgment to the local network device if the linked  
4 network device is capable of transmitting at the new transmission speed.

1           27.    The article of manufacture of claim 26, wherein the code causes the  
2 network device operating as the local and linked network devices to continue to transmit

3 data at the current transmission speed until the linked network device returns a positive  
4 acknowledgment.

1 28. The article of manufacture of claim 23, wherein the code causes the  
2 network device operating as the linked network device, to return negative  
3 acknowledgment to the local network device, in response to the speed change request, if  
4 the linked network device is not capable of transmitting at the new transmission speed.

1 29. The article of manufacture of claim 23, wherein the code causes the  
2 network device operating as the local network device to either increase the transmission  
3 speed if the local network device is capable of transmitting at a transmission speed that is  
4 higher than the current transmission speed or decrease the transmission speed if the local  
5 network device is capable of transmitting at a transmission speed that is lower than the  
6 current transmission speed.

1 30. The article of manufacture of claim 23, wherein the code causes the  
2 network device operating as the local network device to:  
3 maintain transmission information indicating transmission capabilities of the  
4 linked network device, wherein the determined new transmission speed is a new  
5 transmission speed that the transmission information indicates that the linked network  
6 device is capable of performing.

1 31. The article of manufacture of claim 23, wherein the code causing the  
2 network device operating as the local network device comprises a device driver to  
3 communicate with the local network device to determine the new transmission speed,  
4 wherein setting the registers in the local network device comprises the device driver  
5 changing advertised capabilities of the local network device indicated in the registers, and  
6 wherein transmitting the speed change request comprises restarting an auto-negotiation



7 process that selects a common transmission speed based on the changed advertised  
8 capabilities in the local network device.

1 32. The article of manufacture of claim 31, wherein the determined new  
2 transmission speed is higher than the current transmission speed, and wherein changing  
3 the advertised capabilities comprises removing any transmission speeds indicated in the  
4 advertised capabilities of the local network device that are less than the determined new  
5 transmission speed.

1 33. The article of manufacture of claim 31, wherein the determined new  
2 transmission speed is lower than the current transmission speed, and wherein changing  
3 the advertised capabilities comprises removing any transmission speeds indicated in the  
4 advertised capabilities of the local network device that are higher than the determined  
5 new transmission speed.

1 34. The article of manufacture of claim 23, wherein the speed change event  
2 comprises an application program determining an anticipated increase of data  
3 transmissions through the local network device, and wherein the new transmission speed  
4 is higher than the current transmission speed.

1 35. The article of manufacture of claim 23, wherein the speed change event  
2 comprises detecting a change in network traffic at the local network device